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ABSTRACT

Railroad right-of-ways can provide an outdoor classroom where many indigenous organisms and other natural resources can be directly experienced. A typical class can be divided into 3 or 4 segments, with each representing a study group assigned to a specific area of investigation. Suggested activities and questions are presented for the following: embankment, railroads, ties, rails, soil, micro-climate, speed, and distance. A checklist of a railroad track covered the major topics of man, mammals, birds, insects, and plants. It was noted that sciences, social studies, mathematics, language arts, art, and music can be easily enriched when concepts inherent in each discipline are extended to the railroad track outdoor laboratory. (PS)

Environmental Education

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Exploring Railroad Track Ecology As An Outdoor Teaching Technique

by
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Railroads played an important role in the shaping of our nation. Railroads opened up new regions for settlement and established patterns for urbanism. Railroads were the result of a human cognitive mode and scientific method. In the development of our culture, railroads provided the rapid transportation of both people and the products of civilization. With great speed, railroads were built to reach every major region of settlement and passed through countless villages and hamlets. In some instances the railroad gave reason for the small community's existence.

Today there are railroad tracks accessible to the majority of those inspired teachers who wish to utilize them as teaching stations and for the enrichment of many curriculum areas. Railroad tracks are available both in rural and urban situations. In some urban situations railroad tracks represent the only available outdoor laboratory to the urban classroom. It also has the characteristic of being readily accessible and usually within walking distance to most schools.

Railroad right-of-ways can provide an outdoor classroom where many indigenous organisms and other natural resources can be experienced in a direct manner. The banks of the track bed and the adjacent land area protecting the right-of-way are veritable oases for outdoor teaching. Here, concepts of ecology can be developed much in the same way that they are developed in more extensive land areas such as a field or forest. Most of the studies will be terrestial by nature because of the absence of water resources.

A typical class can be divided into three or four segments with each segment representing a study group assigned to a specific area of investigation. Precautions must be taken if the railroad track is used extensively. A copy of the train schedule would facilitate safety and insure against the possibility of an accident. Railroad tracks carrying mostly freight trains are perhaps the least likely to be heavily used during the day. Spur lines are perhaps the least used of active railroad tracks.

Abandoned railroad beds can be developed into interesting and significant outdoor laboratories. Alternatives to railroad tracks might be the utilization of pipe line or high tension wire right-of-ways. This technique, however, will concern itself just with the railroad track as an outdoor classroom.

The following division of study groups, suggested activities, and questions are presented:

Railroad Track Ecology Study

Embankment:

1. What is the average degree of slope of the railroad track embankment?

2. Does this change?
3. At what points does it change? (i.e. on a turn, street crossing, etc.)

Note: A simple ruler with a protractor attached to it; a piece of string with a weight attached can provide the degree of slope. Another technique would be to use a string, a line level, a yardstick, and a tape measure. Rise over run times 100 will give the percentage of slope.

Railroad Ties:

1. Are railroad ties spaced evenly at all locations?
2. What is the length and width of the tie?
3. What is the number of baord feet in each tie?
4. What is the average number of board feet in a specific length of track? (i.e. $\frac{1}{4}$ mile)
5. How many trees were used in that length of track?

Note: A Biltmore stick which is a measuring device used for estimating board feet in a tree will be useful as well as tape measure and pedometer.

Rails:

1. What is the length of a section of rail?
2. Is there any difference in length between various rail sections?
3. Is there ever a vertical difference between the rails?
4. Does this difference occur at special locations? Where?
5. Is there any expansion between the rails on hot or cold days? How much?

Note: A clinometer made with a protractor, a string, and a lead weight in addition to a yard stick or meter stick will be useful here.

Soil:

1. What is the ratio of the relative compactness of the soil between the tracks and soil to the side of the embankment?
2. Is the soil more acid inbetween the rails than it is on the embankment? Is the soil on the rar edge of the right-of-way the same as it is in the embankment or between the rails?

Note: A soil compaction guage made from an empty spool of thread, a dowel, and an elastic band will be useful here. A pencil might also serve the same purpose although not as sophisticated as the former technique. A simple soil testing kit for acidity or Ph can also be effective in studying the soil of the railroad track. A small hand lens is another useful tool in this instance.

Micro-climate:

1. What are the differences between the temperature on the rails, ties, bed, etc.?
2. What is the mean temperature of the rail within a specified distance?

3. What is the temperature of the soil between the rails, the embankment, the right-of-way?

Note: A thermometer with an attached string will be useful here. A simple thermometer attached to a flat board can be utilized as a soil thermometer. Thermometers can also be placed into a grooved piece of flat wood for added protection for use in micro-climates studies.

Speed:

1. How long does it take a train to travel between the point of the railroad crossing signal and the crossing itself? Precaution: stand a safe distance from the track when doing this assignment.
2. How long does it take for sound to travel along a certain distance of track? This can be accomplished by striking the track and timing the length of time it takes for the sound to be heard with someone listening with ear pressed to the iron rail a certain distance from the striker.
3. How does this compare with the speed of sound through the air over the same distance?

Note: A starter's pistol similar to that used in timing racing events will be useful for this activity. A carpenter's hammer is useful as a striking device on the iron rails. A stop watch will be useful although the sweep hand of a regular wrist watch will suffice.

Distance:

1. How can you use a pencil to estimate the distance between two points of the track? (Pencil is held on a horizontal plane and a second person stands down the track. He moves until the person holding the pencil tells him to stop. This will be at the point where the pencil covers the width of both rails. This distance can then be measured. From here on the pencil can be used as the measuring device when the distance of a specific length of track is measured.)
2. What is the distance on the straight-a-way between the curves? What is the average distance between curves over a specific range?
3. What is the average width of the cleared right-of-way along the track?

Note: A tape measure will be useful for this activity. However, it is possible to use a long length of rope or string with knots representing either inches or feet or both as the major measuring device.

Checklist Survey of Railroad Track

Man:

Litter_____
Cutting of shrubs and woody plants_____
Evidence of weed control spraying_____
Debris from train_____
Discarded ties_____
Cast away spikes_____
Pieces of metal_____

Erosion of embankment_____
Rocks and gravel piled up_____
Thinning of brush and trees_____
Mildly burnt areas_____
Fires leaving large blackened areas_____

Mammals:

Evidence of animal holes in the ground_____
Mole tunnels_____
Mouse tunnels_____
Seeds or nuts eaten or partially eaten_____
Animal droppings_____
Feathers or fur of eaten animals_____
Trees or shrubs stripped or gnawed_____
Evidence of animal holes in trees_____
Herbs and grass nibbled to ground_____
Dug-up soil under shrubs or trees_____
Trees and shrubs with leaves and bark eaten away to high level_____
Seeds stored in ground, under logs, under railroad ties, etc._____

Birds:

Holes in dead trees_____
Seeds drop far from point of origin_____
Holes in live trees such as woodpecker holes, etc._____
Bird droppings_____
Bird feathers_____
Fertilizing of flowers_____
Bird nests in trees or shrubs_____
Bird nests on the ground_____
Berry producing trees and shrubs attracting birdlife_____
Identification of birds overhead above the canopy_____
Identification of birds in the canopy_____
Identification of birds in the understory_____
Identification of birds on the tree trunk_____
Identification of birds at the shrub level_____
Identification of birds on the herbaceous and ground levels_____

Insects:

Tiny holes in bark of trees_____
Insect eggs and pupae (cocoons, etc.) found in cracks in bark, on twigs, leaves, etc._____
Tunnels between bark and wood_____
Large holes in leaves_____
Tiny holes or tunnels under leaf layers_____
Leaves with discolored parts_____
Holes and discoloring in fruits or plants_____
Webs on leaves or branches_____
Holes and discoloring of roots of plants_____
Small to large balls or bulges (galls) on leaves, twigs, branches, etc._____
Bees' nests_____

Plants:

Lichens and mosses growing on ties or rocks of bed_____
Liverworts, ferns, and small herbs growing in right-of-way_____
Grasses and larger herbs_____
Shrubs or bushes_____
Wildflowers_____
Domestic flowers_____
Small to medium size deciduous trees_____
Small to medium size coniferous trees_____
Climax trees such as mature oaks or hickories_____
Influence of embankment slope on plant succession_____
Signs of plant interaction:

Ordinary vines climbing up over trees, bushes, etc._____
No sign of constricting vines_____
Strangling vines_____
Parasitic vines and other tree parasites_____
Blighted and dying trees_____
Trees overcrowding each other in young growth_____
Trees fallen on other trees or shrubs_____
Nurse or foster mother trees that help young trees get started_____

Other Activities for Railroad Track Ecology Study

1. Use a compass to ascertain what direction the tracks run.
2. From what direction is the prevailing wind?
3. What are the wettest areas along the tracks?
4. Make a soil profile of the railroad track embankment, the top of the bed, and in the right-of-way. Use a soil auger to obtain samples from various depths and glue to a card.
5. Make a plant analysis of the small plants growing on the embankment. Use a wire coat hanger in the shape of a circle. Check each time a plant occurs inside the ring during each of the twenty throws. Ten occurences out of twenty tosses indicates a fifty per cent incidence analysis.
6. Do you find the same plants near the track as you do at 15 feet, twenty feet, or 30 feet away?
7. What kind of trees are the railroad ties made of? Use an increment borer to take a core from the tie. This may facilitate identification of the wood.
8. Does the railroad use the natural lay of the land to lay its tracks? Use a hand held sight level to determine the answer to this question.
9. Is the bedding of the track native to the area? If not, where did the rock come from?
10. Are there pieces of coal and ballast such as was used in steam locomotives? When did the last steam locomotive use the track? How can you find the answer to this question? To what sources would you go?

Railroad tracks can provide the opportunity to put many concepts to work that are originally learned in the classroom. There are probably many more activities that can be conducted as investigative procedures at the railroad track. Science,

social studies and mathematics can be easily enriched when concepts inherent in each discipline are extended to the railroad track outdoor laboratory. Other disciplines such as language arts, art, and music can also be enhanced by an excursion to this unique laboratory. It is up to the imaginative and creative teacher to go beyond the four walls in the quest for more meaningful learning experiences.